Patent Claims

1. A method for manufacturing gas turbine components, in particular blades, blade segments, or rotors having integral blades for an aircraft engine, characterized by the following steps:
a) providing at least one metal powder (10) and at least one foaming agent (11),
b) mixing (12) the metal powder or each metal powder with the foaming agent or each foaming agent,
c) compacting (13, 14) the resulting mixture to form at least one precursor (15),
d) foaming (16) the precursor or each precursor by heating up to a defined degree of foaming
e) terminating the foaming process (16) by cooling when the defined degree of foaming is reached.

2. The method as recited in Claim 1,
characterized in that an aluminum-based alloy and/or a titanium-based alloy and/or a nickel-based alloy and/or an intermetallic alloy is/are provided as the metal powder (10).

3. The method as recited in Claim 1 or 2,
characterized in that titanium hydride (11) is provided as the foaming agent.

4. The method as recited in one or more of Claims 1 through 3,
characterized in that the mixture of the metal powder or each metal powder with the foaming agent or each foaming agent is compacted to form the precursor by extrusion (13) or axial pressing (14).

5. The method as recited in one or more of Claims 1 through 4,
characterized in that the precursor is foamed in a mold.

6. The method as recited in Claim 5,
characterized in that the mold is actively heated and actively cooled during the foaming process

(16) in order to obtain a gas turbine component having a closed and supporting exterior wall of a defined wall thickness.

7. The method as recited in one or more of Claims 1 through 7,
characterized in that metal powders having different melting points are mixed with the foaming agent or each foaming agent.

8. The method as recited in one or more of Claims 1 through 8,
characterized in that metal powders having different powder granularities are mixed with the foaming agent or each foaming agent.

9. The method as recited in one or more of Claims 1 through 9,
characterized in that, in addition to the foaming agent, the metal powder is mixed with ceramic particles and/or ceramic fibers.

10. The method as recited in one or more of Claims 1 through 9,
characterized in that at least one supporting and/or function-relevant component (27, 28, 29, 30, 31, 46) made of a non-foamable material is at least partially surrounded by foam or partially embedded in foam during the foaming process (16) of the precursor.

11. The method as recited in Claim 10,
characterized in that the precursor to be foamed and the component to be partially surrounded by foam or partially embedded in foam are made of the same material or are made of different materials.

12. The method as recited in Claim 10 or 11,
characterized in that, for manufacturing a blade (19, 23, 32, 36, 44), in particular a compressor blade or a turbine blade for an aircraft engine, the precursor is foamed in a mold, a blade root made of a non-foamable material being partially surrounded by foam or partially embedded in foam during the foaming process (16) of the precursor.

13. The method as recited in Claim 10 or 11,
characterized in that, for manufacturing a blade (44), in particular a compressor blade or a turbine blade for an aircraft engine, the precursor is foamed in a mold with at least one integrated flow channel, at least one component (46) forming the flow channel being surrounded by foam during the foaming process of the precursor.

14. The method as recited in one or more of Claims 1 through 12,
characterized in that, for manufacturing a rotor having integral blades, individual blades or blade segments are provided by foaming the appropriate precursor in a mold, the blades or blade segments provided in this way being fixedly joined with a forged or cast rotor carrier via soldering or welding.

15. The method as recited in one or more of Claims 1 through 14,
characterized in that, subsequent to the cooling process, further processing (17) of the component is carried out, in particular coating of the component's surface.

16. A gas turbine component, in particular a blade (19, 23, 32, 36, 44), a blade segment, or a rotor having integral blades for an aircraft engine,
characterized in that same is manufactured using a method as recited in one or more of Claims 1 through 15.

17. The gas turbine component, in particular a blade (19, 23, 32, 36, 44), a blade segment, or a rotor having integral blades for an aircraft engine,
characterized in that same is made at least partially of a metal foam.

18. The gas turbine component as recited in Claim 17,
characterized in that the metal foam has a locally variable porosity adapted to the component's geometry.

19. The gas turbine component as recited in Claim 17 or 18,
characterized in that the metal foam has a closed and supporting exterior wall.

20. The gas turbine component as recited in one or more of Claims 17 through 19, characterized in that ceramic particles and/or ceramic fibers are incorporated in the metal foam.

21. The gas turbine as recited in one or more of Claims 17 through 20, characterized in that at least one supporting and/or function-relevant component made of a non-foamable material is at least partially embedded in the metal foam.

22. The gas turbine component as recited in one or more of Claims 17 through 21, characterized in that same is designed as a blade (19, 23, 32, 36, 44), in particular as a compressor blade or as a turbine blade for an aircraft engine, the blade (19, 23, 32, 36, 44) being formed from a metal foam, having a closed exterior wall, and a blade root made of a non-foamable material which is partially embedded in foam.

23. The gas turbine component as recited in one or more of Claims 17 through 21, characterized in that same is manufactured using a method as recited in one or more of Claims 1 through 15.